What is claimed is:

1. A method of creating a binary-coding pattern to be used in binary-coding a multi-value image, said method comprising the steps of:

(a) creating a basic pattern shape of the prospective binary-coding pattern by a first arithmetic operation;

(b) determining the sequence of lighting pixels composing such basic pattern by a second arithmetic operation; and

(c) creating a rectangular pattern, which serves as the prospective binary-coding pattern, based on the resultant basic pattern.

2. A method of creating a binary-coding pattern according to claim 1, wherein, in said step (c), said rectangular pattern is created by a third arithmetic operation.

3. A method of creating a binary-coding pattern according to claim 1, wherein said step (a) includes the steps of:

(a-1) designating a pattern angle through which said binary-coding pattern is turned;

(a-2) designating the number of pixels composing said basic pattern; and

(a-3) executing an arithmetic operation based on said

pattern angle designated in said step (a-1) and said number of pixels designated in said step (a-2).

4. A method of creating a binary-coding pattern according to claim 2, wherein said step (a) includes the steps of:

(a-1) designating a pattern angle through which said binary-coding pattern is turned;

(a-2) designating the number of pixels composing said basic pattern; and

(a-3) executing an arithmetic operation based on said pattern angle designated in said step (a-1) and said number of pixels designated in said step (a-2).

5. A method of creating a binary-coding pattern according to claim 3, wherein, in said step (a),

one or more rectangles are created which have the following corner points: point A(c, 1); point B(a+c, b+1); point C(0, d+1); and point D(a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an equation of $n = ad + bc$, where n is the number of pixels, which is designated in said step (a-2), and

the one, out of such rectangles, which is at an angle approximate to said pattern angle designated in said step (a-1), is selected as said basic pattern.

6. A method of creating a binary-coding pattern

according to claim 4, wherein, in said step (a),

one or more rectangles are created which have the following corner points: point A(c, 1); point B(a+c, b+1); point C(0, d+1); and point D(a, b+d+1), parameters *a*, *b*, *c*, and *d* being arbitrary integers satisfying an equation of $n=ad+bc$, where *n* is the number of pixels, which is designated in said step (a-2), and

the one, out of such rectangles, which is at an angle approximate to said pattern angle designated in said step (a-1), is selected as said basic pattern.

7. A method of creating a binary-coding pattern according to claim 1, wherein, in said step (b), said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each of the last-named pixels.

8. A method of creating a binary-coding pattern according to claim 6, wherein, in said step (b), said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each of the last-named pixels.

9. A method of creating a binary-coding pattern according to claim 7, wherein, in said step (b), said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the

one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

10. A method of creating a binary-coding pattern according to claim 8, wherein, in said step (b), said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

11. A method of creating a binary-coding pattern according to claim 7, wherein, in said step (b), said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

12. A method of creating a binary-coding pattern according to claim 8, wherein, in said step (b), said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

13. A method of creating a binary-coding pattern

according to claim 9, wherein, in said step (b), said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

14. A method of creating a binary-coding pattern according to claim 10, wherein, in said step (b), said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

15. A method of creating a binary-coding pattern according to claim 1, wherein, in said step (b), said sequence of lighting the pixels is determined based on a weight which has been assigned to each of the pixels by an arithmetic operation according to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

16. A method of creating a binary-coding pattern according to claim 1, wherein, in said step (c), said rectangular pattern is created by cutting a rectangle in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary

image scanning direction.

17. A method of creating a binary-coding pattern according to claim 16, wherein, in said step (c), a motif-pattern showing a distinctive characteristic of said rectangular pattern is cut from said rectangular pattern to represent said rectangular pattern.

18. A method of creating a binary-coding pattern according to claim 17, wherein:

said motif-pattern occupies a rectangular area that is measured Y in the primary scanning direction by i in the secondary scanning direction, thus being composed of $Y \times i$ pixels;

Y measured in the primary scanning direction is equal to a length, measured in the primary scanning direction, of said rectangular pattern of the particular size; and

i measured in the secondary scanning direction is equal to a minimum quantity (the number of pixels), measured in the secondary scanning direction, essential for said rectangular area to include a complete set of lightening sequence numbers determined one for each of the pixels composing the basic pattern in said step (b).

19. A method of creating a binary-coding pattern according to claim 5, wherein, in said step (c), said rectangular pattern is created by an arithmetic operation

such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$size(X) = \max((n \div \gcd(b, n), (n \div \gcd(d, n))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$size(Y) = \max((n \div \gcd(a, n), (n \div \gcd(c, n))$$

20. A method of creating a binary-coding pattern according to claim 6, wherein, in said step (c), said rectangular pattern is created by an arithmetic operation such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$size(X) = \max((n \div \gcd(b, n), (n \div \gcd(d, n))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$size(Y) = \max((n \div \gcd(a, n), (n \div \gcd(c, n))$$

21. A method of creating a binary-coding pattern to be used in binary-coding a multi-value image, said method comprising the steps of:

(a) creating a basic pattern shape of the prospective

binary-coding pattern by a first arithmetic operation;

(b) determining the sequence of lighting pixels composing such basic pattern; and

(c) creating a rectangular pattern, which serves as the prospective binary-coding pattern, based on the resultant basic pattern.

22. A method of creating a binary-coding pattern according to claim 21, wherein, in said step (c), said rectangular pattern is created by a second arithmetic operation.

23. A method of creating a binary-coding pattern according to claim 21, wherein said step (a) includes the steps of:

(a-1) designating a pattern angle through which said binary-coding pattern is turned;

(a-2) designating the number of pixels composing said basic pattern; and

(a-3) executing an arithmetic operation based on said pattern angle designated in said step (a-1) and said number of pixels designated in said step (a-2).

24. A method of creating a binary-coding pattern according to claim 23, wherein, in said step (a),

one or more rectangles are created which have the following corner points: point A(c, 1); point B(a+c, b+1);

point C(0, d+1); and point D(a, b+d+1), parameters *a*, *b*, *c*, and *d* being arbitrary integers satisfying an equation of $n = ad + bc$, where *n* is the number of pixels, which is designated in said step (a-2), and

the one, out of such rectangles, which is at an angle approximate to said pattern angle designated in said step (a-1), is selected as said basic pattern.

25. A method of creating a binary-coding pattern according to claim 21, wherein, in said step (b), said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic pattern and each of the last-named pixels.

26. A method of creating a binary-coding pattern according to claim 25, wherein, in said step (b), said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

27. A method of creating a binary-coding pattern according to claim 25, wherein, in said step (b), said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the

last-named pixels.

28. A method of creating a binary-coding pattern according to claim 21, wherein, in said step (c), said rectangular pattern is created by cutting a rectangle in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

29. A method of creating a binary-coding pattern to be used in binary-coding a multi-value image, said method comprising the steps of:

(a) creating a basic pattern shape of the prospective binary-coding pattern;

(b) determining the sequence of lighting pixels composing such basic pattern by a first arithmetic operation; and

(c) creating a rectangular pattern, which serves as the prospective binary-coding pattern, based on the resultant basic pattern.

30. A method of creating a binary-coding pattern according to claim 29, wherein, in said step (c), said rectangular pattern is created by a second arithmetic operation.

31. A method of creating a binary-coding pattern according to claim 29, wherein said step (a) includes the steps of:

(a-1) designating a pattern angle through which said binary-coding pattern is turned;

(a-2) designating the number of pixels composing said basic pattern; and

(a-3) executing an arithmetic operation based on said pattern angle designated in said step (a-1) and said number of pixels designated in said step (a-2).

32. A method of creating a binary-coding pattern according to claim 31, wherein, in said step (a),

one or more rectangles are created which have the following corner points: point A(c, 1); point B(a+c, b+1); point C(0, d+1); and point D(a, b+d+1), parameters *a*, *b*, *c*, and *d* being arbitrary integers satisfying an equation of $n = ad + bc$, where *n* is the number of pixels, which is designated in said step (a-2), and

the one, out of such rectangles, which is at an angle approximate to said pattern angle designated in said step (a-1), is selected as said basic pattern.

33. A method of creating a binary-coding pattern according to claim 29, wherein, in said step (b), said sequence of lighting the pixels is determined based on a distance between a predetermined point in said basic

pattern and each of the last-named pixels.

34. A method of creating a binary-coding pattern according to claim 33, wherein, in said step (b), said sequence of lighting the pixels is determined in such a manner that the pixels are lighted sequentially from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

35. A method of creating a binary-coding pattern according to claim 33, wherein, in said step (b), said sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

36. A method of creating a binary-coding pattern according to claim 29, wherein, in said step (b), said sequence of lighting the pixels is determined based on a weight which has been assigned to each of the pixels by an arithmetic operation according to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

37. A method of creating a binary-coding pattern according to claim 29, wherein, in said step (c), said

rectangular pattern is created by cutting a rectangle in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

38. A binary-coding pattern which is created based on a basic pattern and is to be used in binary-coding a multi-value image, wherein a series of halftone dots arranged in a network fashion is generated by lighting pixels of said basic pattern sequentially from the one nearer to a predetermined point of the prospective basic pattern in such a manner that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

39. A binary-coding pattern according to claim 38, wherein the sequence of lighting the pixels is determined based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the pixels.

40. A rectangular binary-coding pattern which is created based on a basic pattern and is to be used in binary-coding a multi-value image, wherein a series of halftone dots arranged in a network fashion is generated by lighting pixels of a motif-pattern, which shows a

distinctive characteristic of the binary-coding pattern, in a predetermined sequence, and by arranging said motif-pattern in repetitions in accordance with a predetermined rule.

41. A binary-coding pattern according to claim 40, wherein:

said motif-pattern occupies a rectangular area that is measured *Y* in the primary scanning direction by *i* in the secondary scanning direction, thus being composed of $Y \times i$ pixels;

Y measured in the primary scanning direction is equal to a length, measured in the primary scanning direction, of said rectangular pattern of the particular size; and

i measured in the secondary scanning direction is equal to a minimum quantity (the number of pixels), measured in the secondary scanning direction, essential for said rectangular area to include a complete set of lightening sequence numbers determined one for each of the pixels composing the basic pattern.

42. An apparatus for creating a binary-coding pattern to be used in binary-coding a multi-value image, said apparatus comprising:

a basic pattern shape creating section for creating a basic pattern shape of the prospective binary-coding pattern by a first arithmetic operation;

a lighting sequence determining section for determining the sequence of lighting pixels composing such basic pattern by a second arithmetic operation; and

a rectangular pattern creating section for creating a rectangular pattern, which serves as the prospective binary-coding pattern, by a third arithmetic operation based on the resultant basic pattern.

43. An apparatus for creating a binary-coding pattern according to claim 42, wherein said basic pattern shape creating section includes:

an angle designating section for designating a pattern angle through which the prospective binary-coding pattern is turned;

a number-of-pixels designating section for designating the number of pixels composing said basic pattern; and

an arithmetic section for executing an arithmetic operation based on said pattern angle designated by said angle designating section and said number of pixels designated by said number-of-pixels designating section.

44. An apparatus for creating a binary-coding pattern according to claim 43, wherein:

said basic pattern shape creating section creates one or more rectangles which have the following corner points: point A(c, 1); point B(a+c, b+1); point C(0, d+1);

and point D(a, b+d+1), parameters a, b, c, and d being arbitrary integers satisfying an equation of $n = ad + bc$, where n is the number of pixels which is designated by said number-of-pixels designating section, and

out of such rectangles, said basic pattern shape creating section selects the one which is at an angle approximate to said pattern angle designated by said number-of-pixels designating section, as said basic pattern.

45. An apparatus for creating a binary-coding pattern according to claim 42, wherein said lighting sequence determining section determines said sequence of lighting the pixels based on a distance between a predetermined point in said basic pattern and each of the last-named pixels.

46. An apparatus for creating a binary-coding pattern according to claim 45, wherein said lighting sequence determining section determines said sequence of lighting the pixels in such a manner that the pixels are lighted successively from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted pixels adjoining to the non-lighted ones is minimal.

47. An apparatus for creating a binary-coding

pattern according to claim 45, wherein said lighting sequence determining section determines said sequence of lighting the pixels based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

48. An apparatus for creating a binary-coding pattern according to claim 42, wherein said rectangular pattern creating section cuts such rectangular pattern in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

49. An apparatus for creating a binary-coding pattern according to claim 48, wherein said rectangular pattern creating section cuts a motif-pattern, which shows a distinctive characteristic of the rectangular pattern, from said rectangular pattern as a representative of said rectangular pattern.

50. An apparatus for creating a binary-coding pattern according to claim 49, wherein:

said motif-pattern occupies a rectangular area that is measured Y in a primary scanning direction by i in a secondary scanning direction, thus being composed of $Y \times i$ pixels;

Y measured in the primary scanning direction is equal to a length, measured in the primary scanning direction, of said rectangular pattern of the particular size; and

i measured in the secondary scanning direction is equal to a minimum quantity (the number of pixels), measured in the secondary scanning direction, essential for said rectangular area to include a complete set of lightening sequence numbers determined one for each of the pixels composing said basic pattern.

51. An apparatus for creating a binary-coding pattern according to claim 44, wherein said rectangular pattern creating section creates said rectangular pattern by an arithmetic operation such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$size\,(X) = \max((n \div \gcd(b, n), (n \div \gcd(d, n))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$size\,(Y) = \max((n \div \gcd(a, n), (n \div \gcd(c, n))$$

52. A computer-readable recording medium which stores a binary-coding pattern creating program for creating a binary-coding pattern to be used in

binary-coding a multi-value image, wherein said program instructs a computer to function as the following:

(a) a basic pattern shape creating section for creating a basic pattern shape of the prospective binary-coding pattern by a first arithmetic operation;

(b) a lighting sequence determining section for determining the sequence of lighting pixels composing such basic pattern by a second arithmetic operation; and

(c) a rectangular pattern creating section for creating a rectangular pattern, which serves as the prospective binary-coding pattern, by a third arithmetic operation based on the resultant basic pattern.

53. A computer-readable recording medium according to claim 52, wherein said basic pattern shape creating section includes:

an angle designating section for designating a pattern angle through which the prospective binary-coding pattern is turned;

a number-of-pixels designating section for designating the number of pixels composing said basic pattern; and

an arithmetic section for executing an arithmetic operation based on said pattern angle designated by said angle designating section and said number of pixels designated by said number-of-pixels designating section.

54. A computer-readable recording medium according to claim 53, wherein:

said basic pattern shape creating section creates one or more rectangles which have the following corner points: point A(c, 1); point B(a+c, b+1); point C(0, d+1); and point D(a, b+d+1), parameters *a*, *b*, *c*, and *d* being arbitrary integers satisfying an equation of $n = ad + bc$, where *n* is the number of pixels which is designated by said number-of-pixels designating section, and

out of such rectangles, said basic pattern shape creating section selects the one which is at an angle approximate to said pattern angle designated by said number-of-pixels designating section, as said basic pattern.

55. A computer-readable recording medium according to claim 52, wherein said lighting sequence determining section determines said sequence of lighting the pixels based on a distance between a predetermined point in said basic pattern and each of the last-named pixels.

56. A computer-readable recording medium according to claim 55, wherein said lighting sequence determining section determines said sequence of lighting the pixels in such a manner that the pixels are lighted successively from the one nearer to a predetermined point of said basic pattern, and that the length of an outline of the lighted

pixels adjoining to the non-lighted ones is minimal.

57. A computer-readable recording medium according to claim 55, wherein said lighting sequence determining section determines said sequence of lighting the pixels based on a coefficient which relates to a distance between a predetermined point in said basic pattern and each of the last-named pixels.

58. A computer-readable recording medium according to claim 52, wherein said rectangular pattern creating section cuts such rectangular pattern in a particular size from a spread of said basic patterns in which said basic patterns are arranged successively in both a primary image scanning direction and a secondary image scanning direction.

59. A computer-readable recording medium according to claim 58, wherein said rectangular pattern creating section cuts a motif-pattern, which shows a distinctive characteristic of said rectangular pattern, from said rectangular pattern as a representative of said rectangular pattern.

60. A computer-readable recording medium according to claim 59, wherein:

said motif-pattern occupies a rectangular area that

is measured *Y* in a primary scanning direction by *i* in a secondary scanning direction, thus being composed of *Y* × *i* pixels;

Y measured in the primary scanning direction is equal to a length, measured in the primary scanning direction, of said rectangular pattern of the particular size; and

i measured in the secondary scanning direction is equal to a minimum quantity (the number of pixels), measured in the secondary scanning direction, essential for said rectangular area to include a complete set of lightening sequence numbers determined one for each of the pixels composing said basic pattern.

61. A computer-readable recording medium according to claim 54, wherein:

said rectangular pattern creating section creates said rectangular pattern by an arithmetic operation such that size (X) of said rectangular pattern measured in a secondary scanning direction satisfies:

$$size(X) = \max((n \div \gcd(b, n)), (n \div \gcd(d, n)))$$

and size (Y) of said rectangular pattern measured in a primary scanning direction satisfies:

$$size(Y) = \max((n \div \gcd(a, n)), (n \div \gcd(c, n)))$$